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Bombino et al.

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(54) **THERMALLY INSULATIVE SPACER AND METHODS INVOLVING USE OF SAME**

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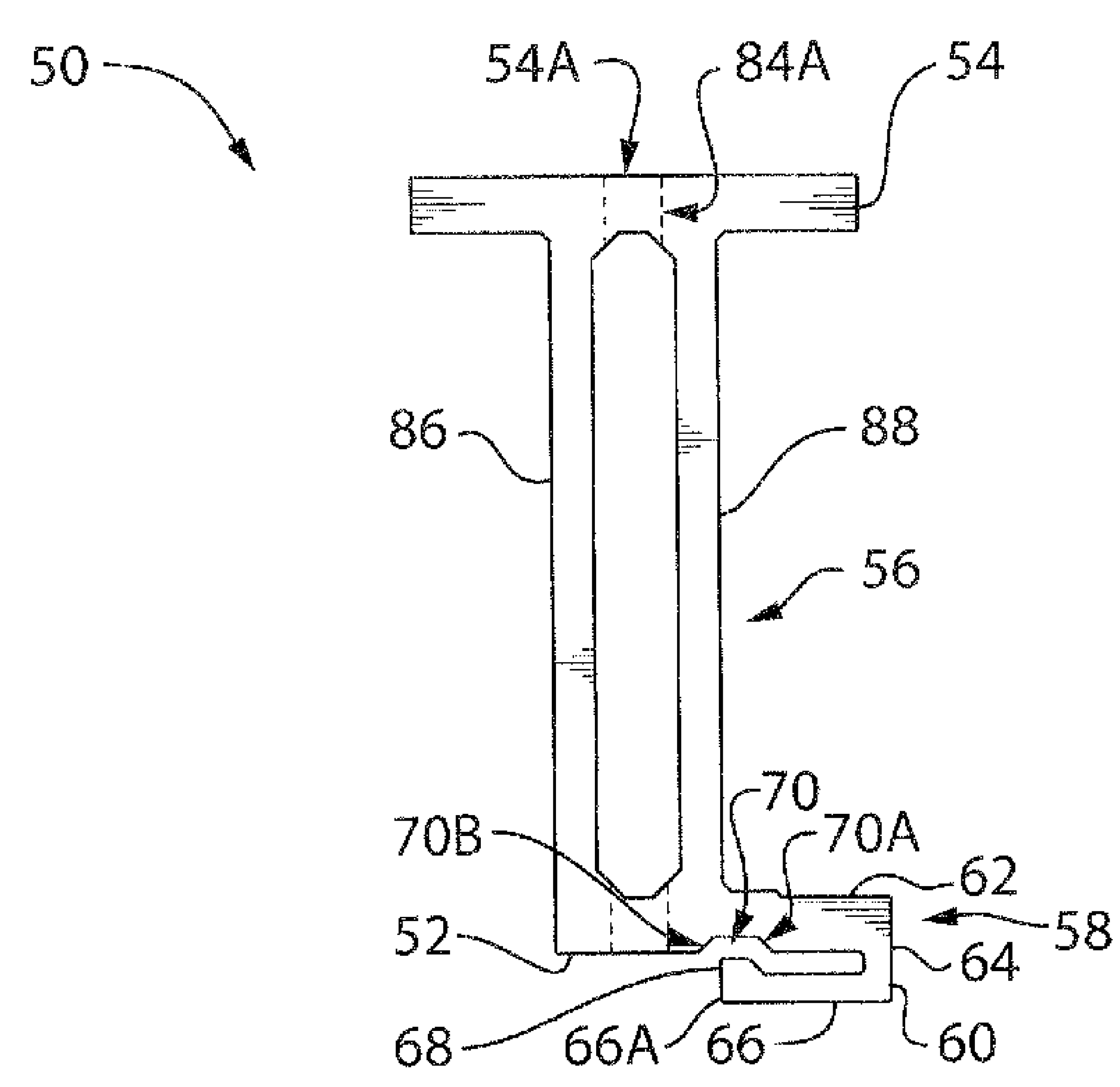
(57) **ABSTRACT**

A spacer for use in spacing a cladding component from a building component has a support member, a base spaced apart from the support member, the base having a contact surface facing away from the support member, a web connected between the support member and the base, and a guide configured to locate the cladding component on the support member. A plurality of the spacers can be used by resiliently deforming them to accommodate and retain by restorative bias force a corresponding plurality of portions of the cladding component. Thereafter, the spacers are secured to the building component.

15 Claims, 13 Drawing Sheets



(51) **Int. Cl.**
E04B 2/74 (2006.01)
E04B 1/76 (2006.01)
E04B 1/41 (2006.01)
E04B 1/38 (2006.01)

(52) **U.S. Cl.**
CPC ***E04B 1/7616*** (2013.01); ***E04B 2/58*** (2013.01); ***E04B 2/7412*** (2013.01); *E04B 1/7608* (2013.01); *E04B 1/7629* (2013.01); *E04B 2001/405* (2013.01)

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USPC 52/483.1, 489.1, 489.2, 474, 407.3, 52/506.05, 508, 512
See application file for complete search history.

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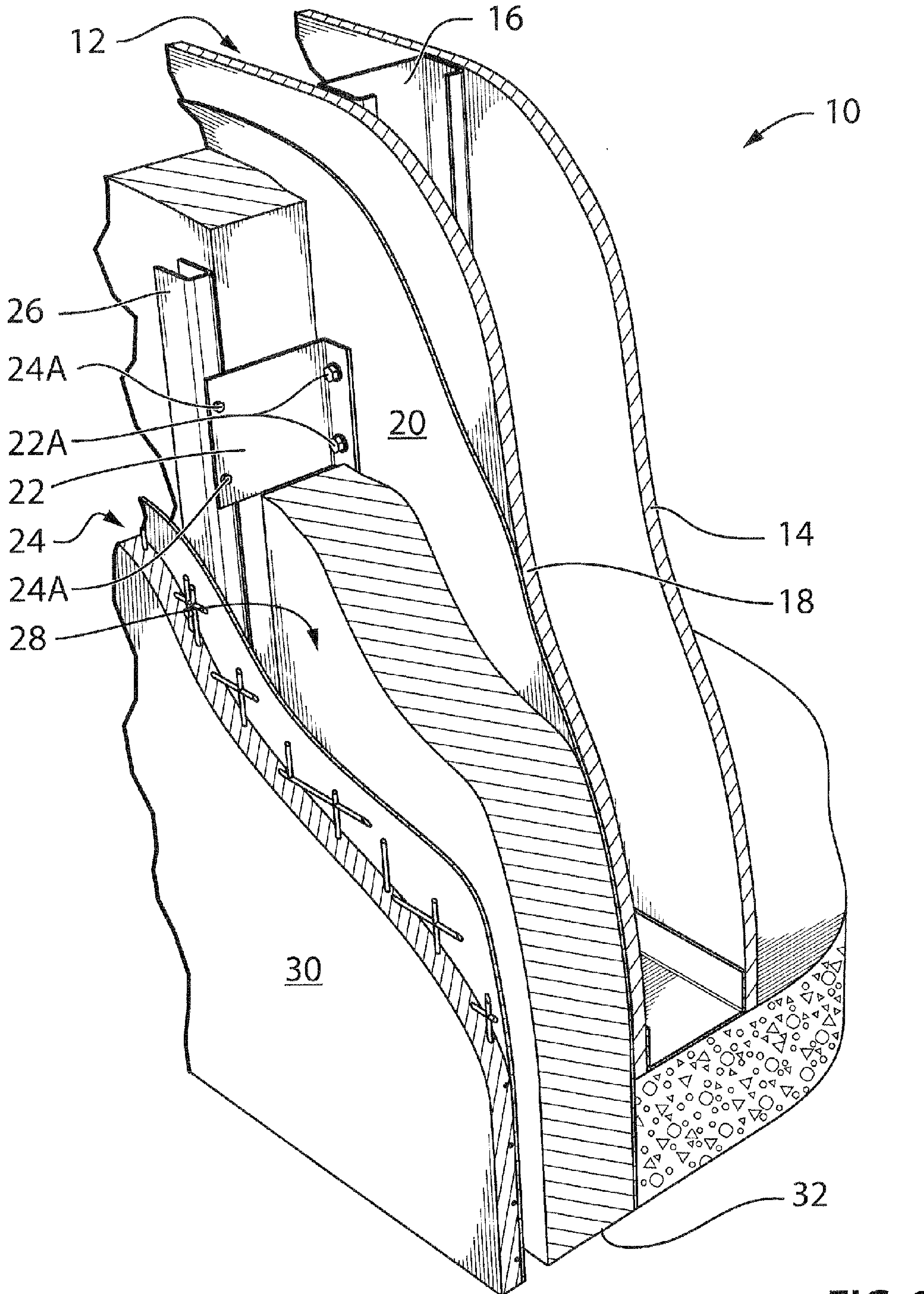


PRIOR ART

FIG. 1

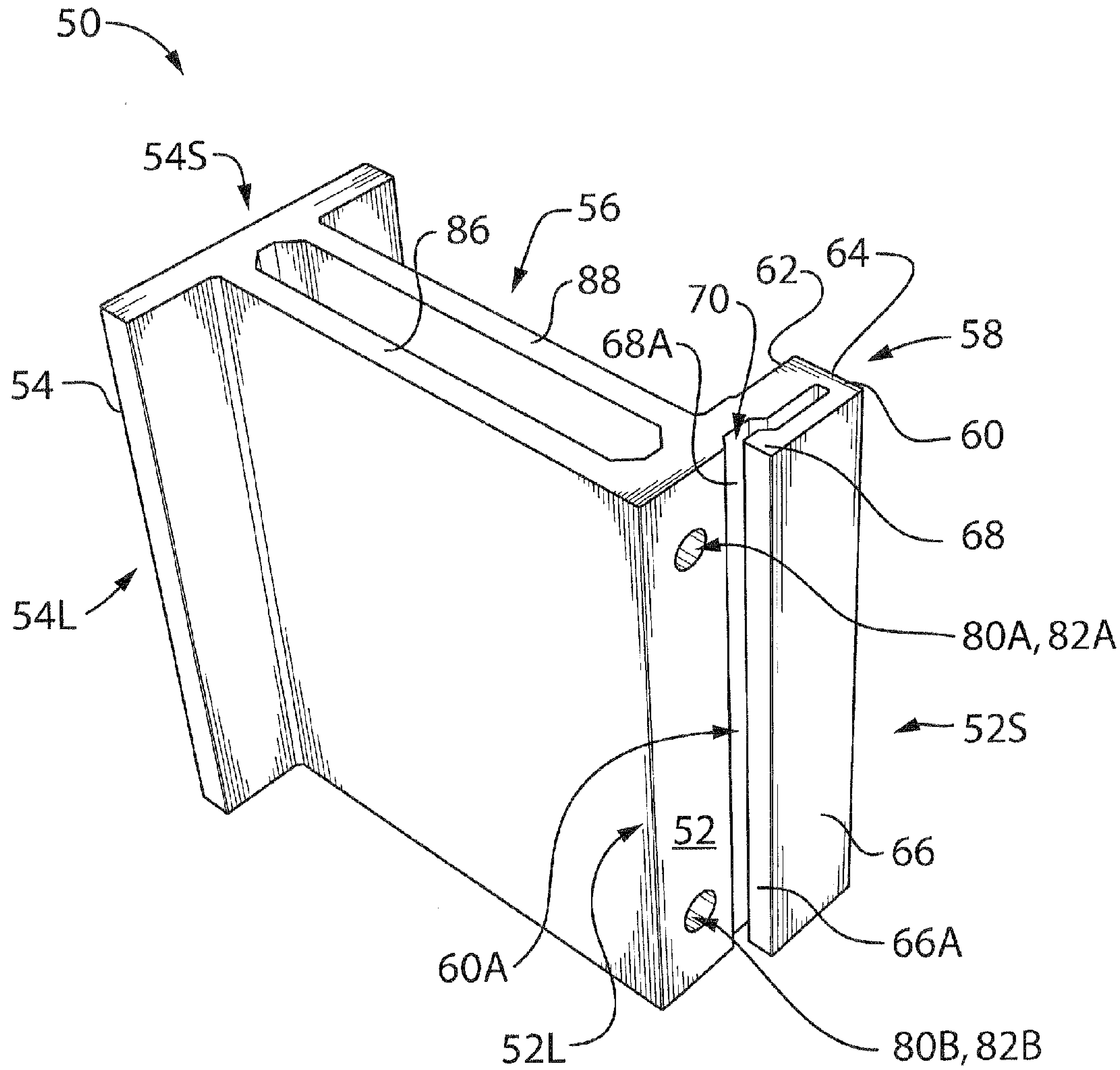
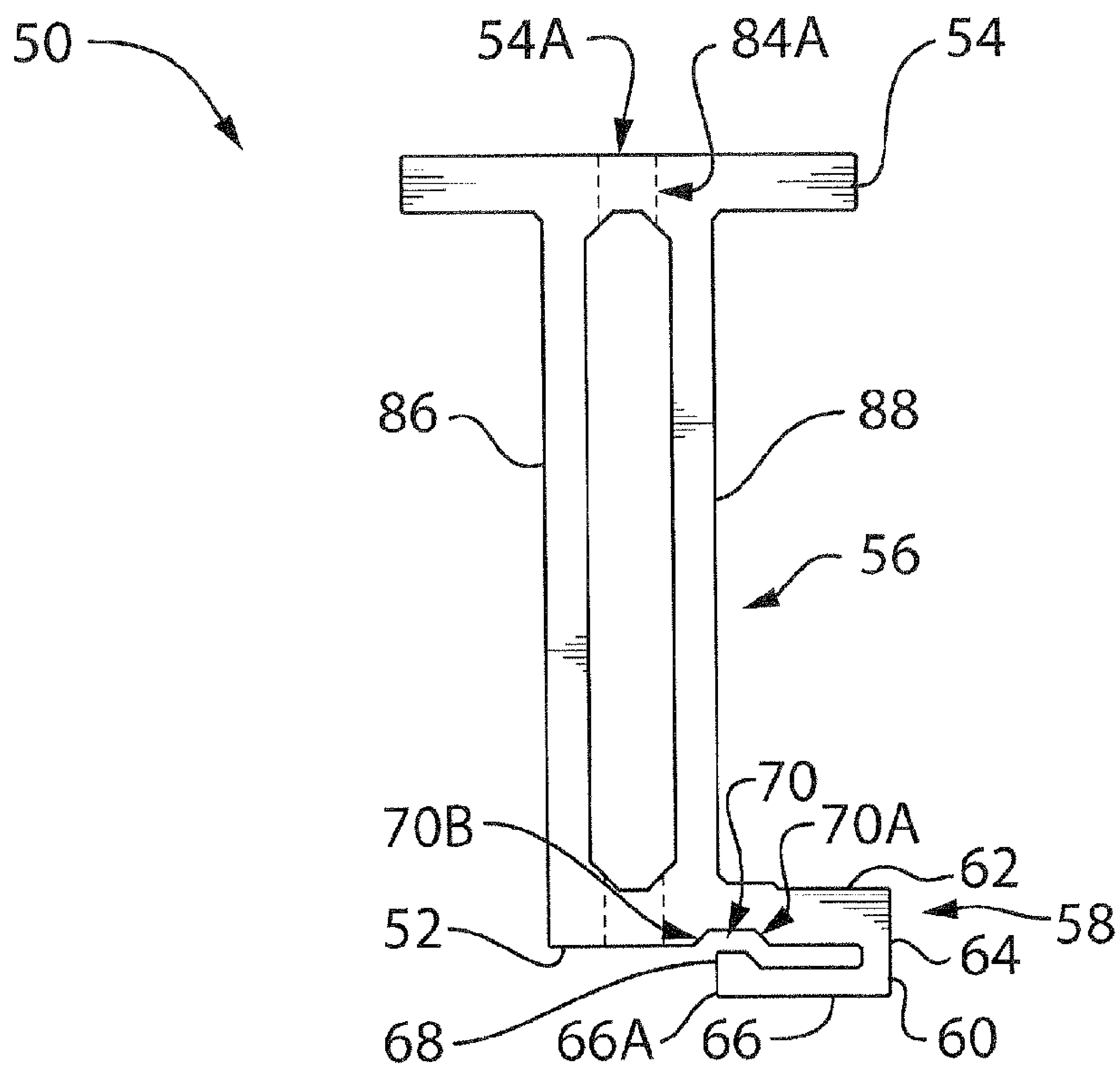
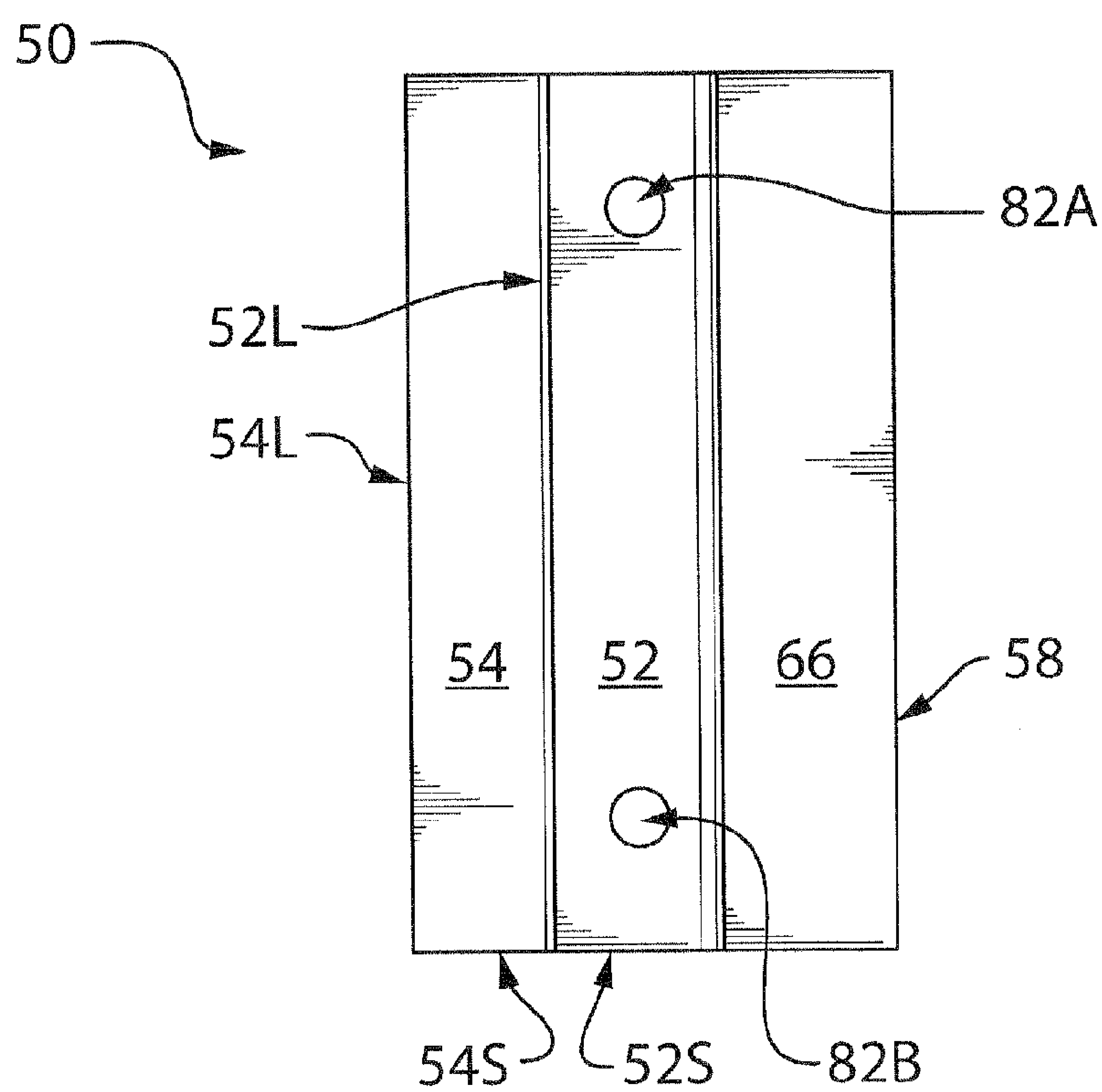

50
54S
56
86
88
64
62
70
68A
58
54
60
68
80A, 82A
54L
52S
52
66
66A
60A
52L
80B, 82B

FIG.2



50
54A
84A
54
86
88
56
70
70B
70A
62
52
58
64
68
66A
66
60

FIG.3



50
82A
52L
54L
54
52
66
58
54S
52S
82B

FIG.4

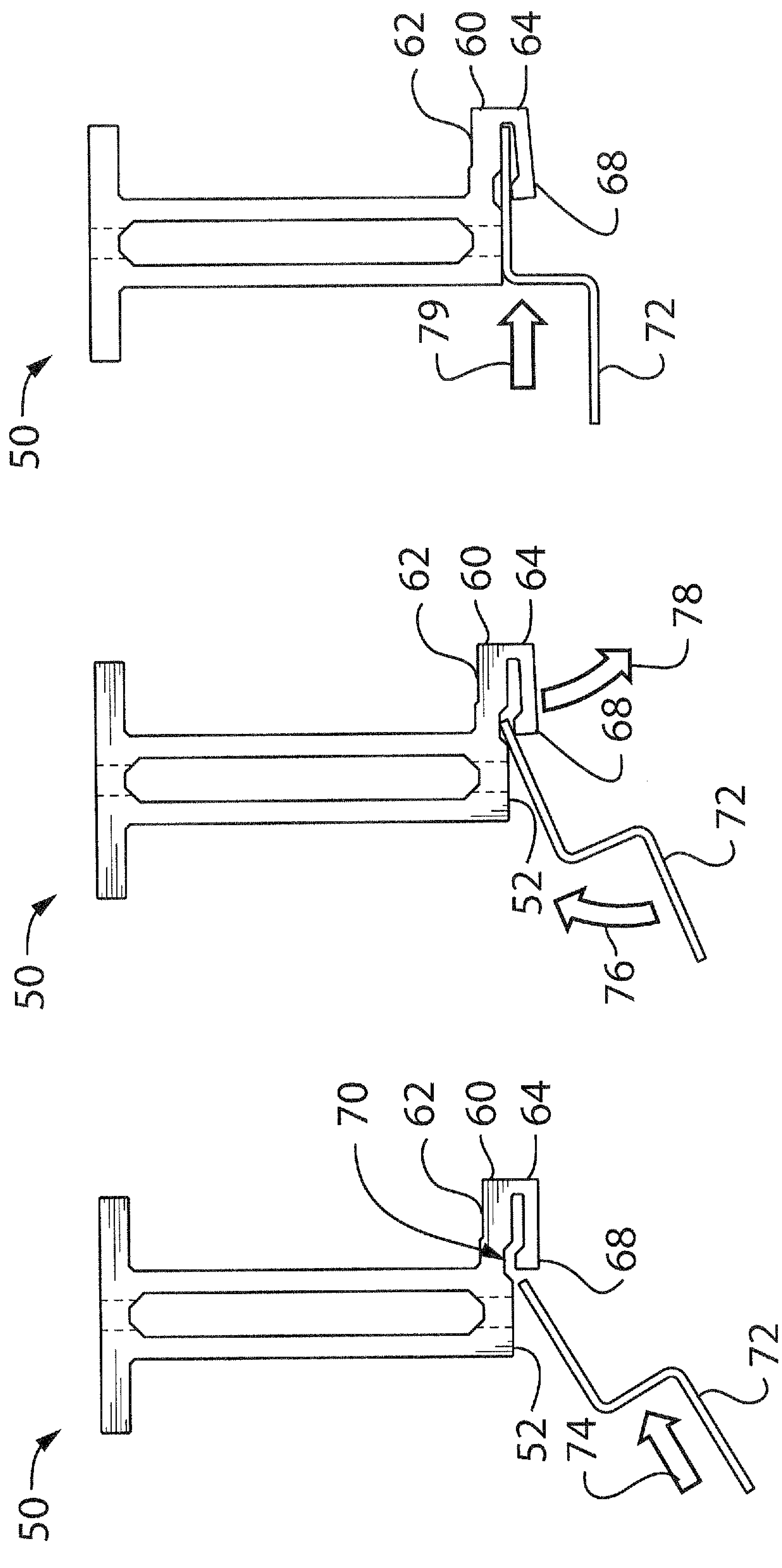


FIG.5C

FIG.5B

FIG.5A

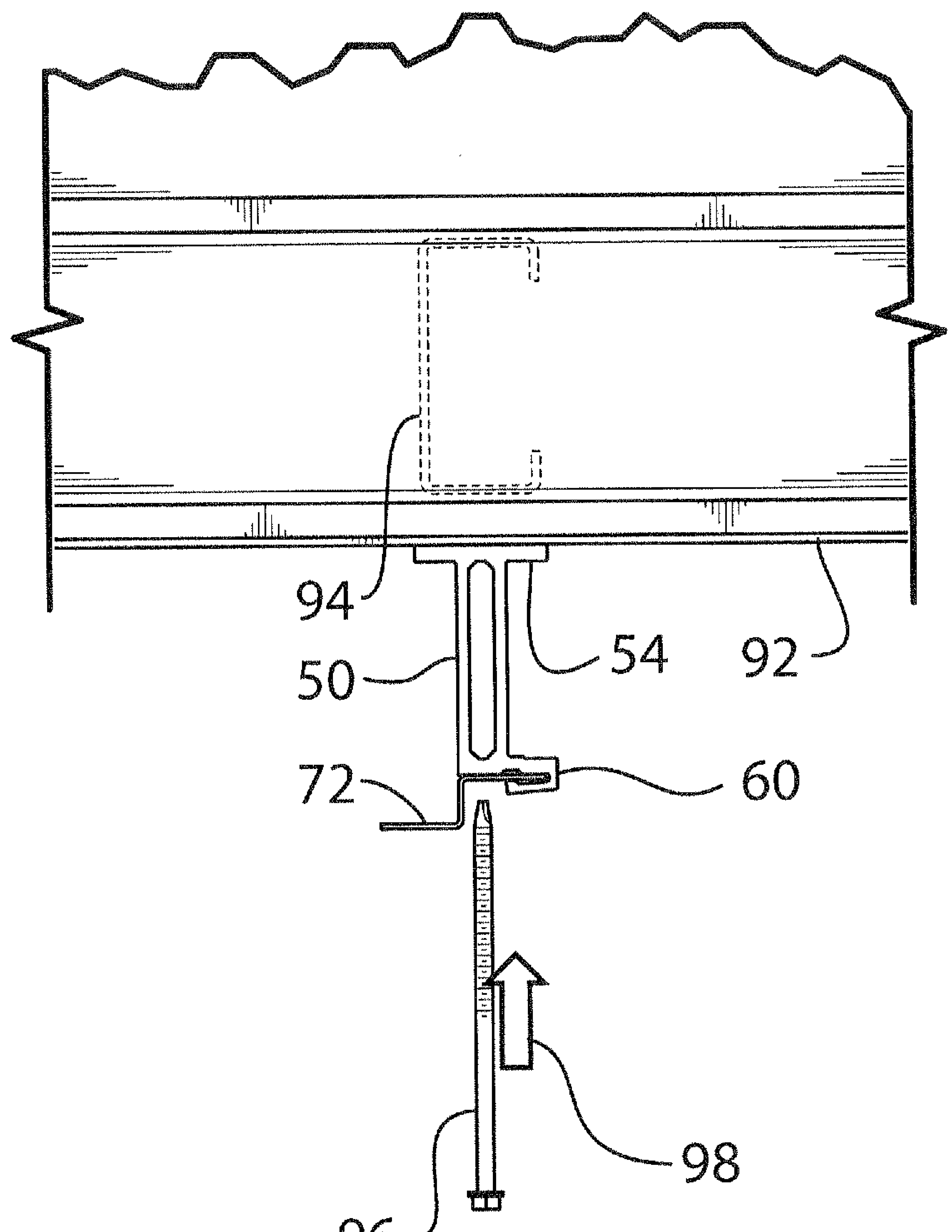


FIG.6

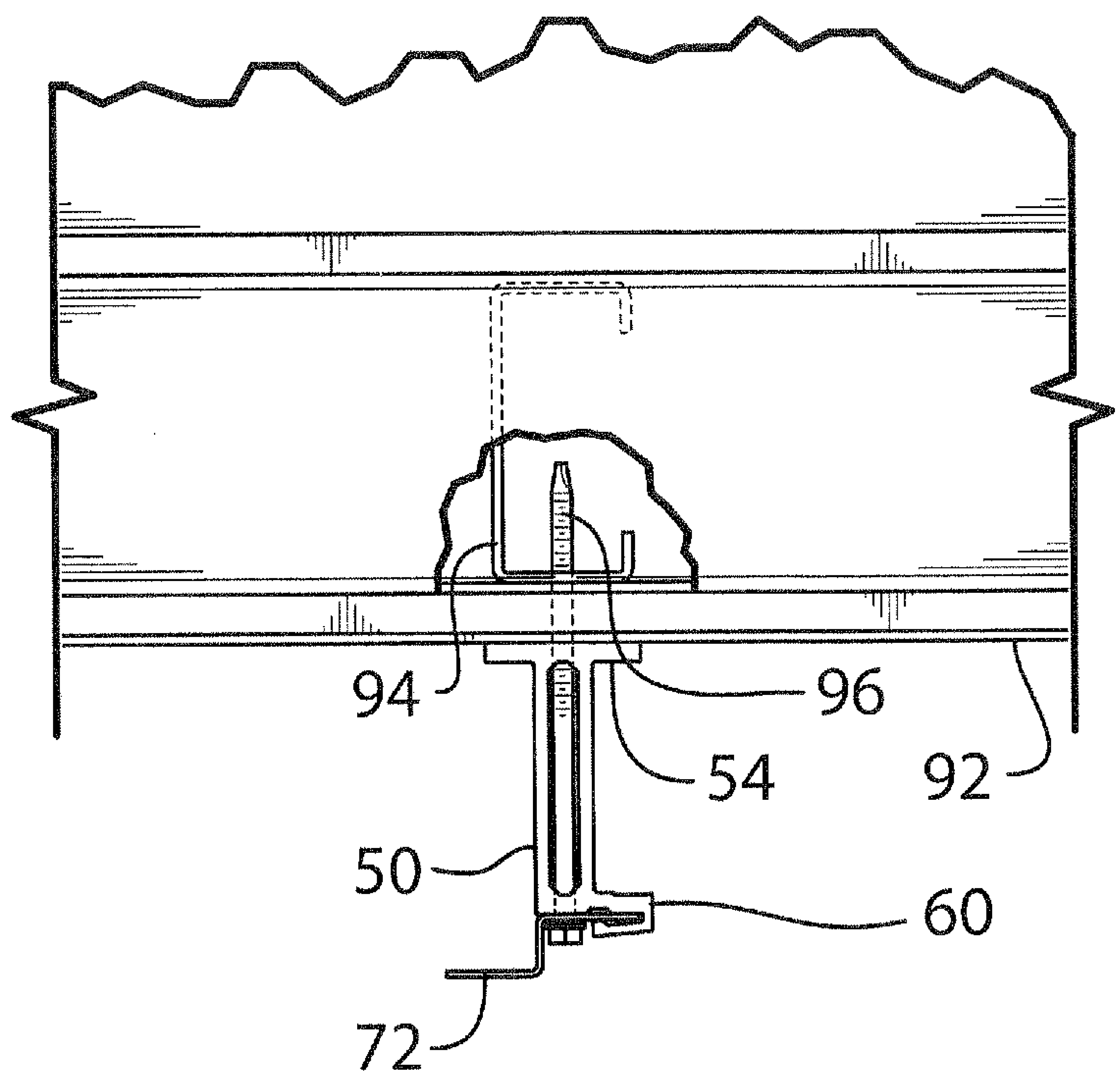


FIG.7

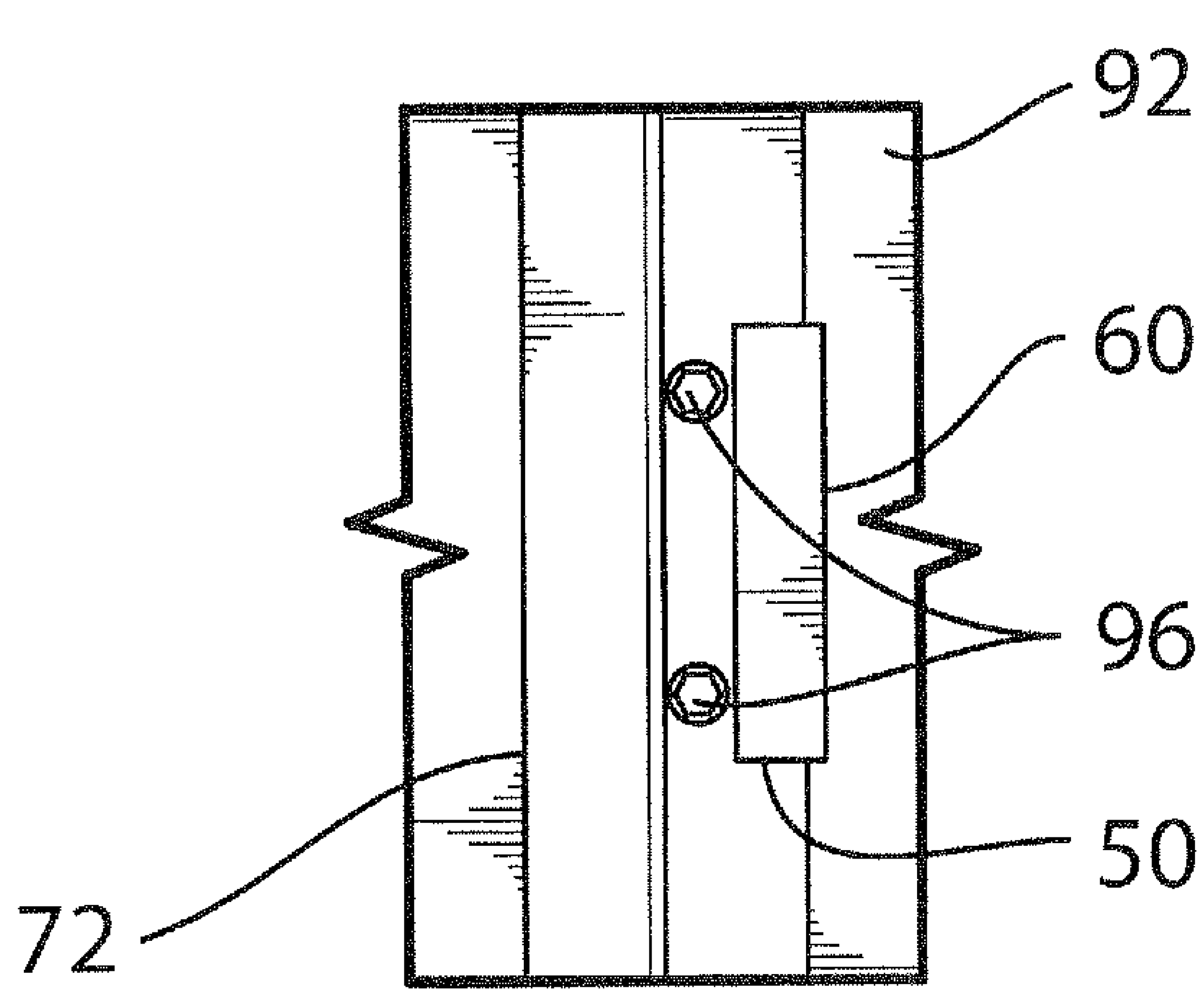


FIG.8

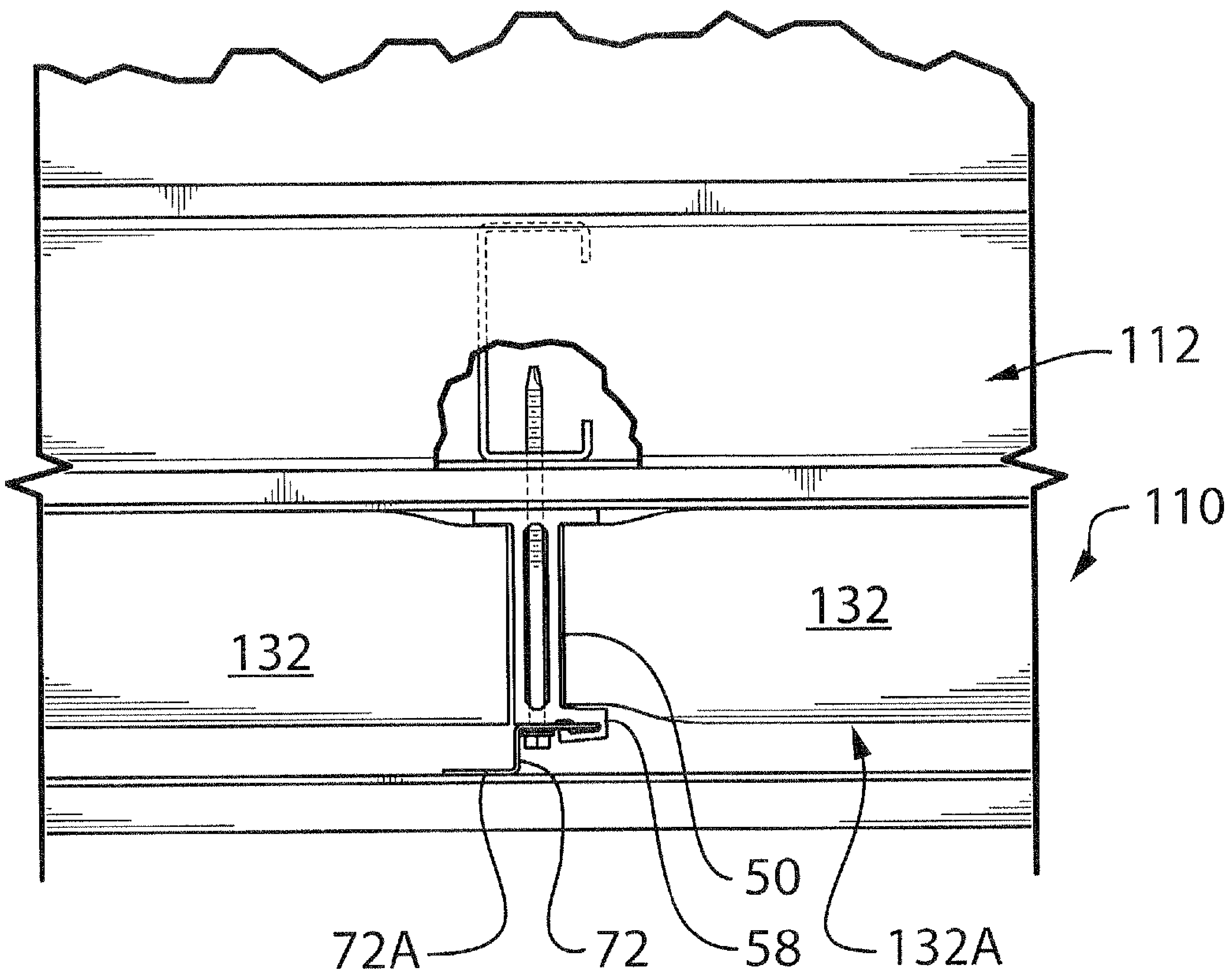


FIG.9

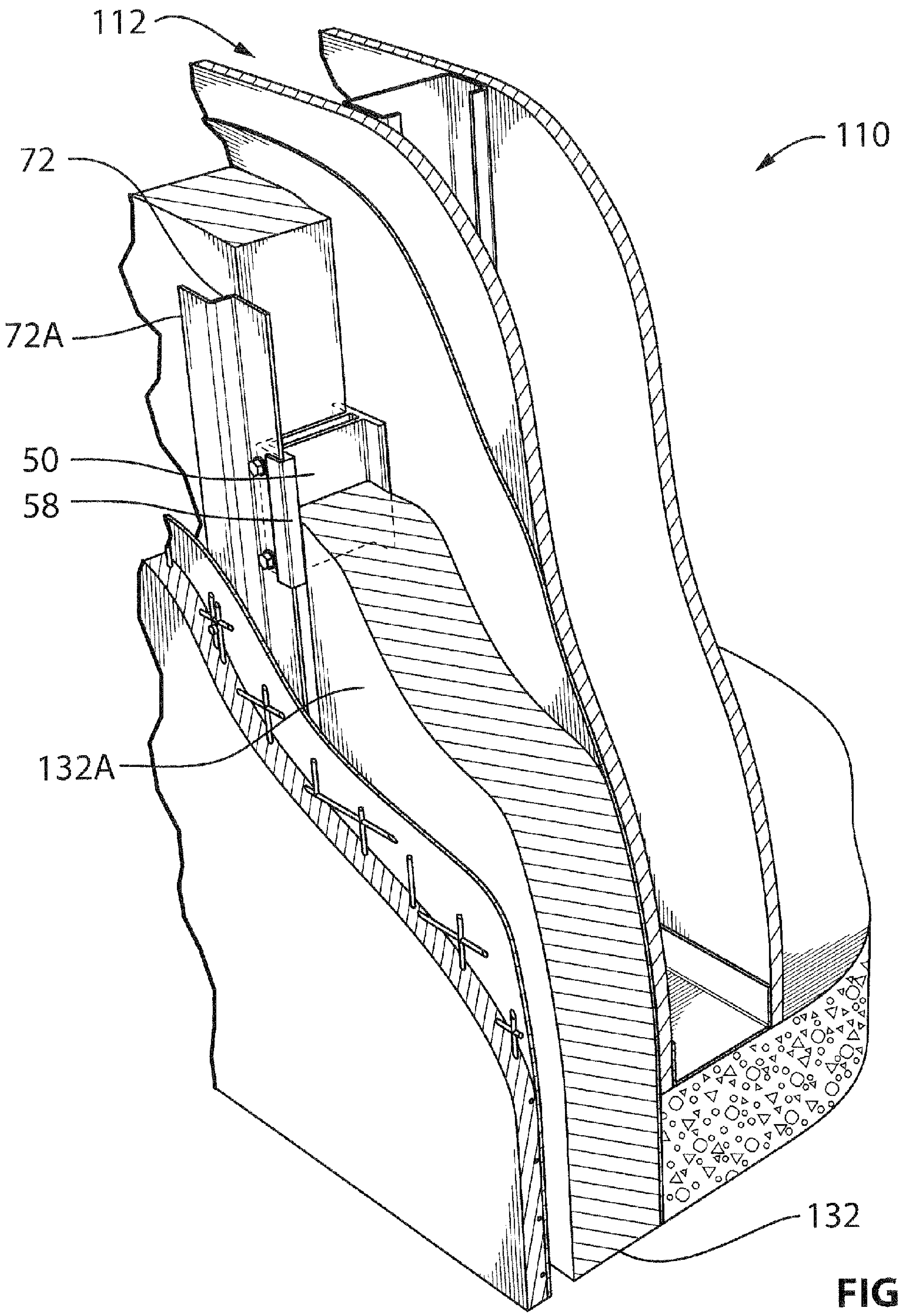


FIG.10

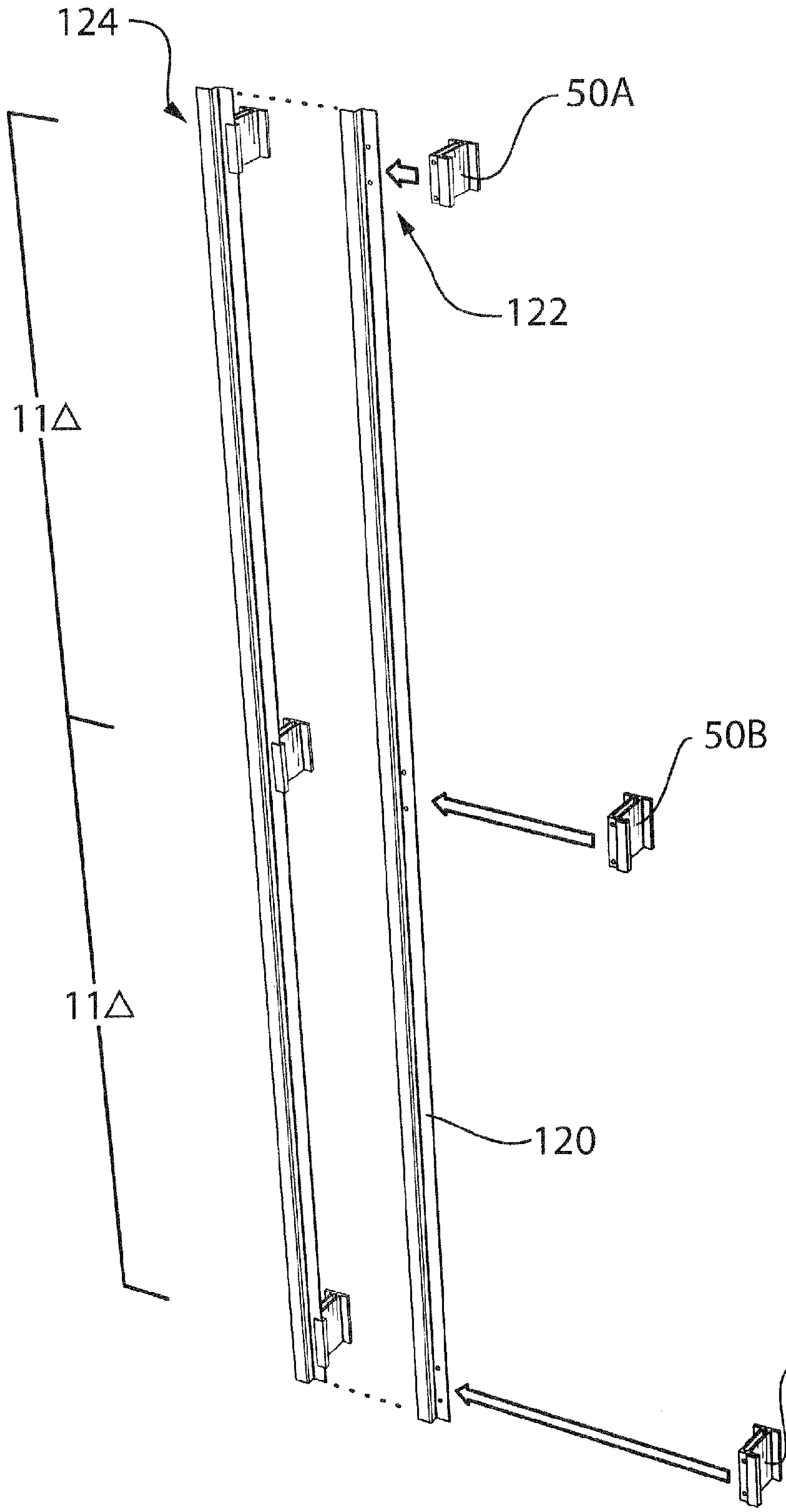


FIG.11

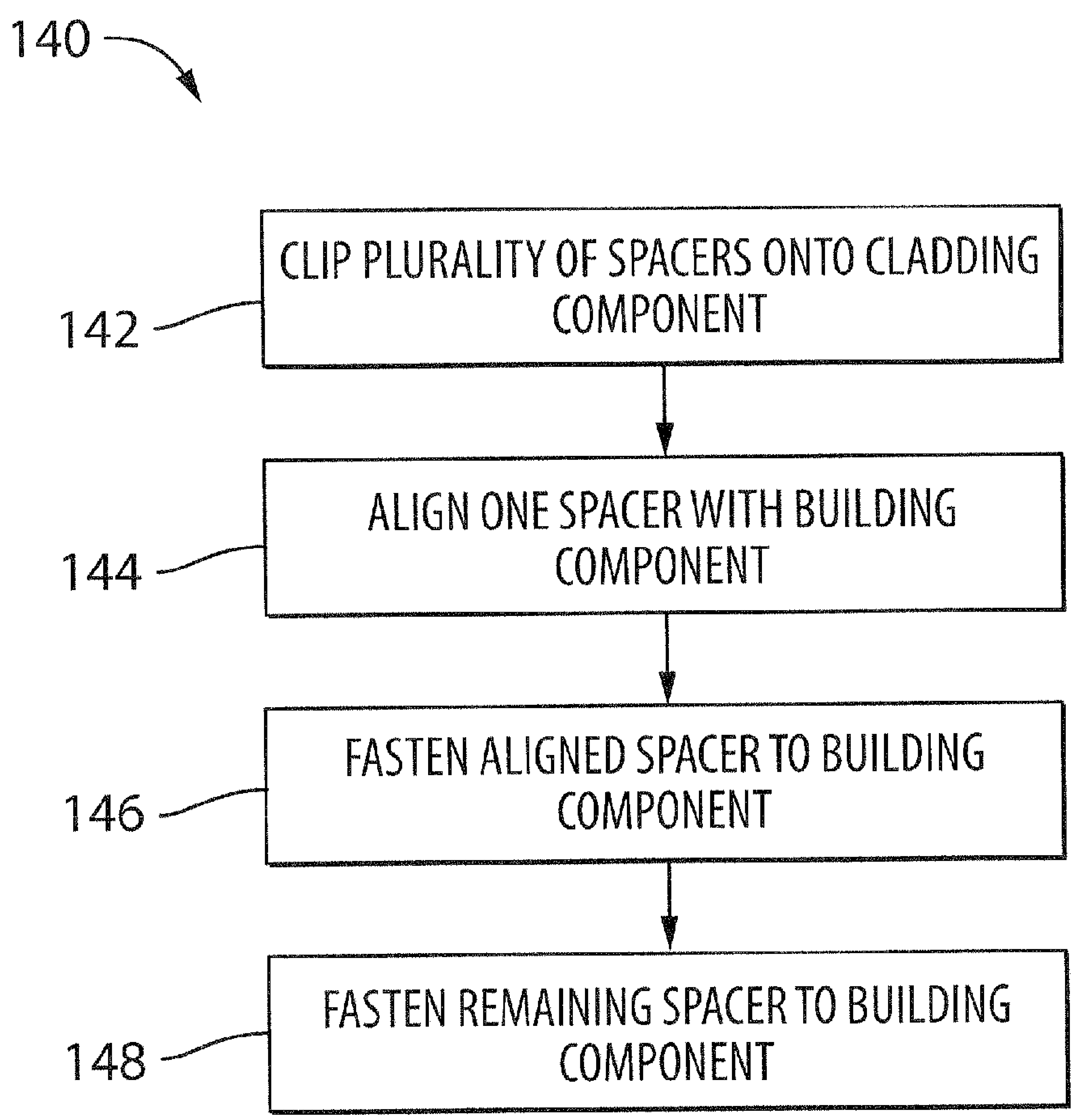

140
142
CLIP PLURALITY OF SPACERS ONTO CLADDING COMPONENT
144
ALIGN ONE SPACER WITH BUILDING COMPONENT
146
FASTEN ALIGNED SPACER TO BUILDING COMPONENT
148
FASTEN REMAINING SPACER TO BUILDING COMPONENT

FIG. 12

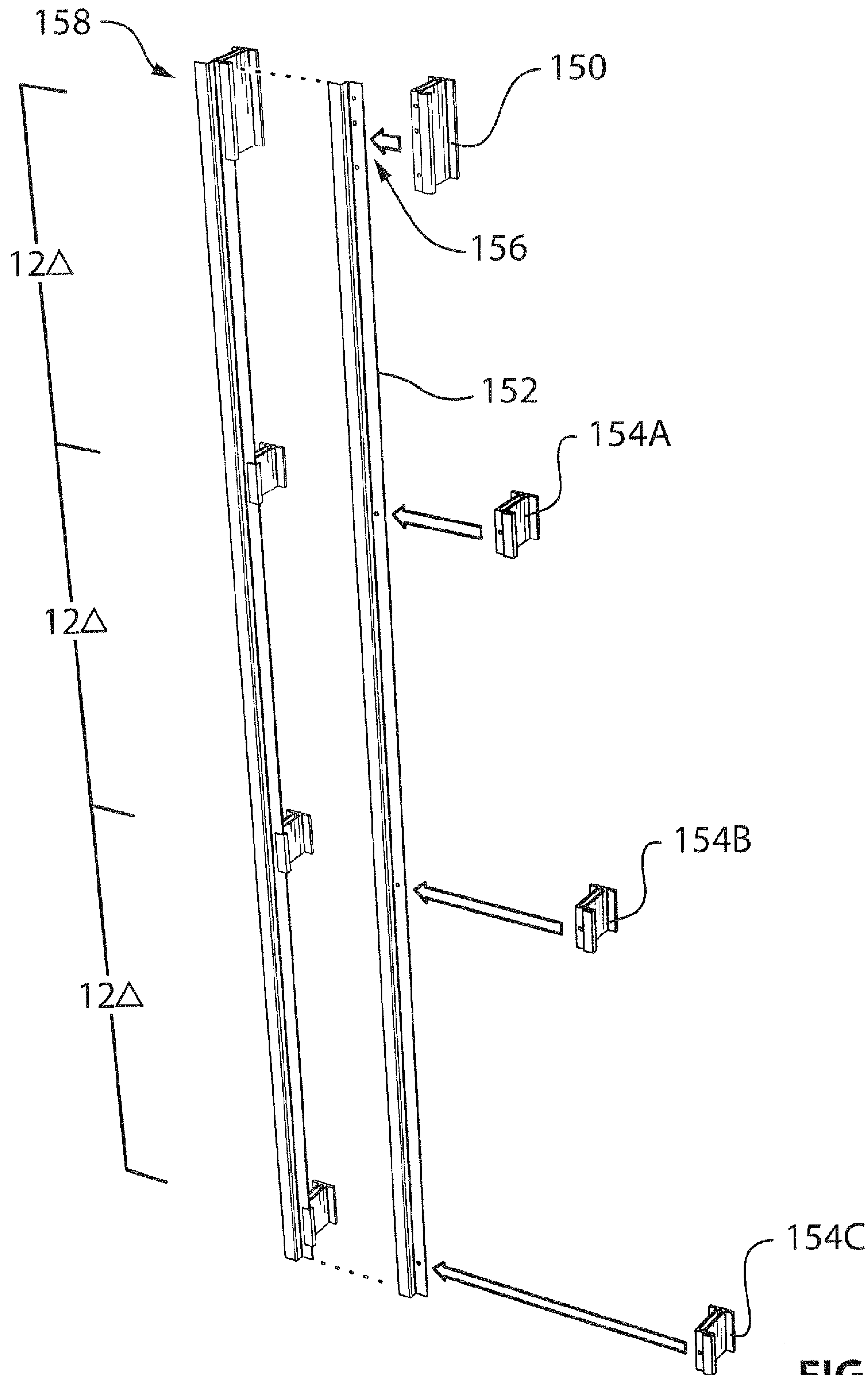


FIG.13

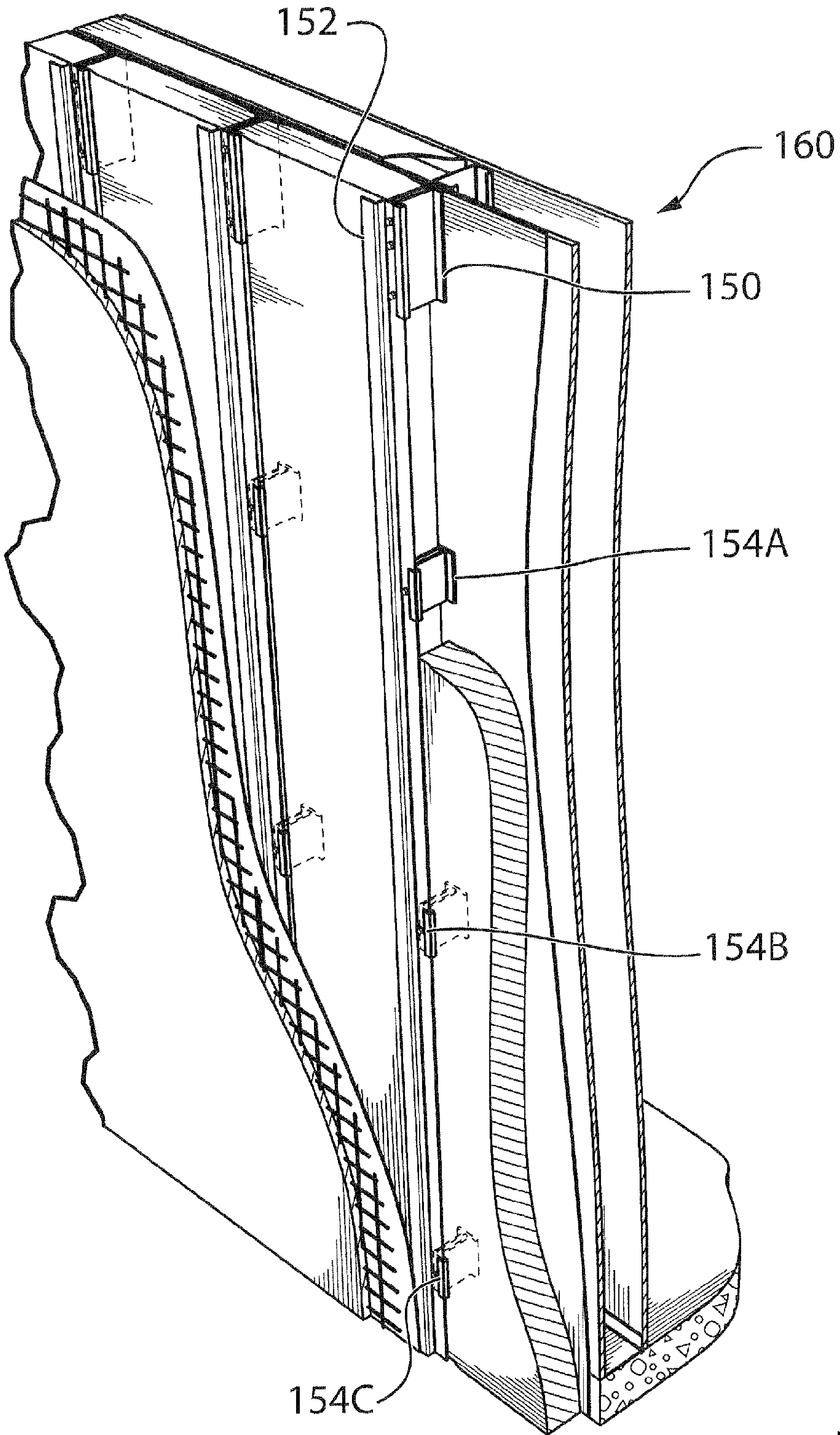


FIG.14

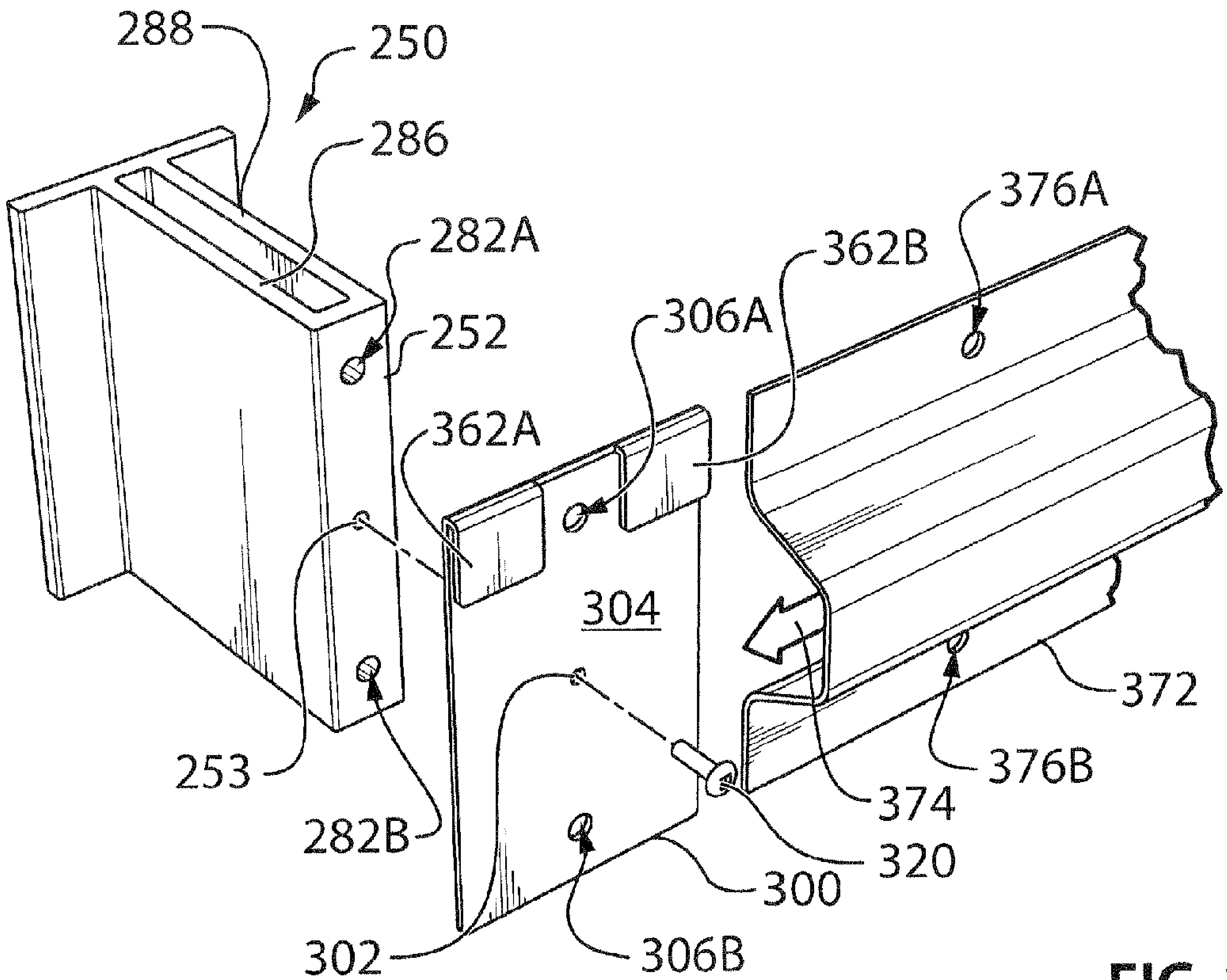

288
250
286
282A
252
362A
306A
362B
376A
304
372
253
282B
374
376B
320
300
302
306B

FIG. 15

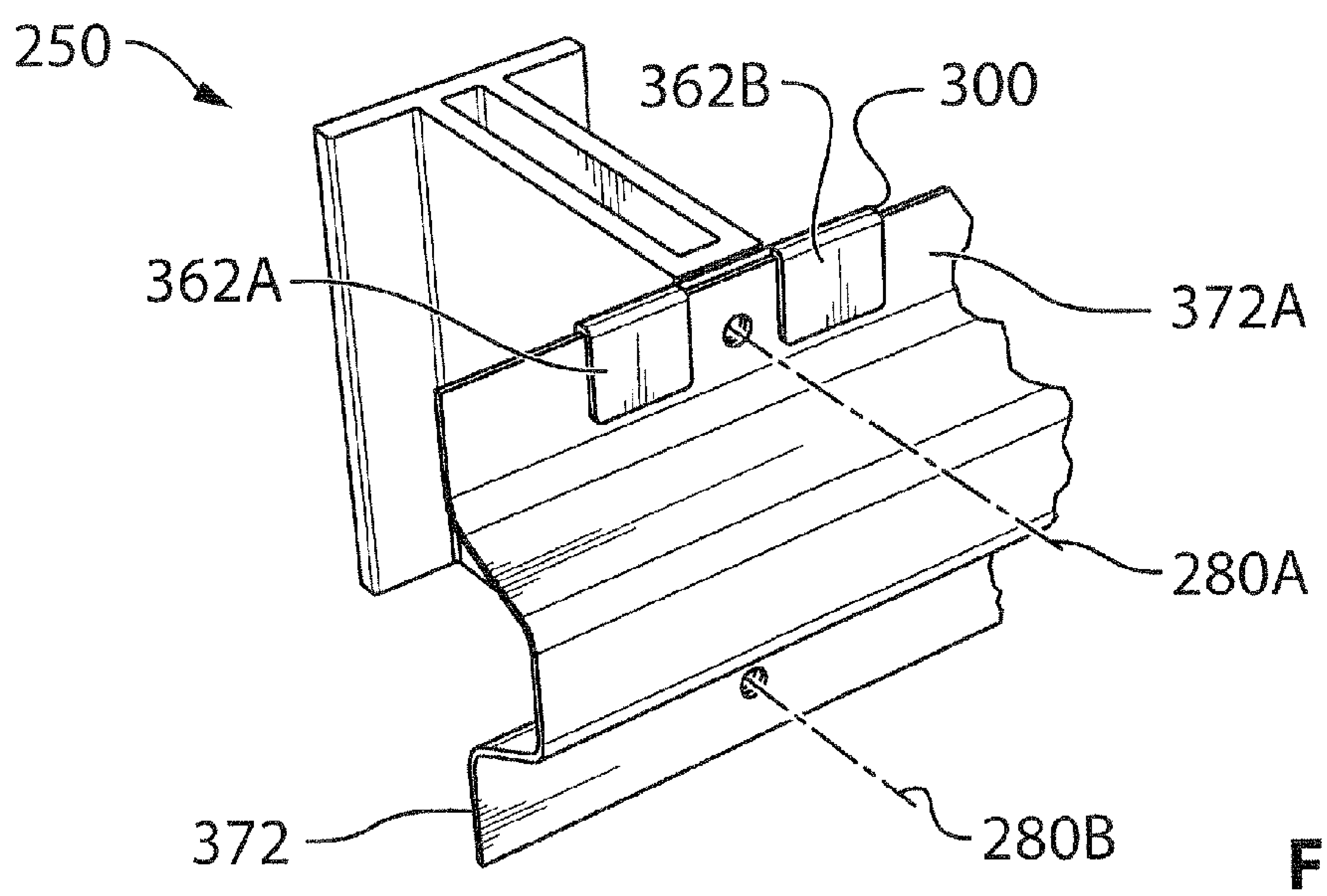

250
362B
300
362A
372A
280A
372
280B

FIG. 16

THERMALLY INSULATIVE SPACER AND METHODS INVOLVING USE OF SAME

REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 13/357,799 filed 25 Jan. 2012, which claims priority to Canadian patent application No. 2763058 filed 5 Jan. 2012. Each of the foregoing applications is hereby incorporated by reference herein in its entirety.

TECHNICAL FIELD

The invention provides thermally insulative spacers useful for supporting cladding components on a building or building component. Particular embodiments provide spacers made of various low conductivity materials, such as fibre reinforced polymers.

BACKGROUND

In constructing buildings, it is common to attach cladding components (e.g., girts, purlins, panels, roofing, etc.) to supportive building components (e.g., steel stud wall studs, concrete or masonry walls, floors, roofs, and other back-up supports). In many applications, it is preferable to provide space between cladding components and the building components for insulation as well as to achieve other performance characteristics including durability. This is typically done by attaching supporting cladding components with spacers or other supports to a back-up structure.

FIG. **1** is a perspective view of an exterior wall assembly **10** that illustrates use of prior art spacers to connect cladding components to supporting building components. Assembly **10** comprises a wall **12** formed by interior finish **14** such as a drywall board, a C-shaped steel stud **16**, and an exterior wall panel or sheathing **18**. A moisture barrier **20** may cover exterior wall sheathing **18**. A galvanized steel spacer **22** is attached to steel stud **16** by screws **22**A that pass through barrier **20**, exterior wall sheathing **18** and at least a portion of stud **16**. Spacer **22** shown in FIG. **1** is one of a plurality of like steel spacers attached to wall **12** in spaced apart, vertically aligned relation. Alternatively, continuous girts are also used to achieve this function. Spacer (or "clip") **22** connects cladding components **24**, which may consist of supporting cladding framework such as elongate vertical steel girt **26**, and exterior finish **30** (e.g., stucco, metal panels, etc.), to wall **12**. Girt **26** is attached by screws **24**A to spacer **22**. Insulation **32** may be provided in the space between wall **12** and cladding components (**24**, **26**, and **30**), and an air cavity and/or moisture drainage cavity **28** may be provided.

In assembly **10**, steel spacer **22** must have sufficient strength and rigidity to support the cladding under the various loads it faces (gravity, wind, seismic, etc.). Steel or other metal clips are typically used due to their strength, stiffness, and fire resistance characteristics. Steel is also relatively inexpensive, durable and adaptable compared to other similar options such as aluminum and other metals.

A problem with wall assembly **10** is that spacer **22**, being made of steel, is thermally conductive and provides a thermal bridge from cladding components **24** (and in some cases **26** and **30**) to wall **12**. Moreover, since spacer **22** is adjacent to steel stud **16**, which is also thermally conductive, spacer **22** and steel stud **16** together provide a thermal bridge from cladding components **24** to interior wall panel **14**. Since insulation **32** is provided around spacer **22** (and in some cases around the steel stud **16**), spacer **22** (and steel stud **16**) acts an insulation bypass. As a result, it is difficult for wall assembly **10** to achieve the high levels of insulative performance demanded by modern construction standards without unduly increasing the depth of spacer **22**, steel stud **16**, and/or insulation **32**.

The foregoing examples of the related art and limitations related thereto are intended to be illustrative and not exclusive. Other limitations of the related art will become apparent to those of skill in the art upon a reading of the specification and a study of the drawings.

SUMMARY

The following embodiments and aspects thereof are described and illustrated in conjunction with systems, tools and methods which are meant to be exemplary and illustrative, not limiting in scope. In various embodiments, one or more of the above-described problems have been reduced or eliminated, while other embodiments are directed to other improvements.

At its simplest, the invention is a spacer for use in spacing a building cladding component from a building component, the spacer comprising a support member; a base spaced apart from the support member, the base having a contact surface facing away from the support member; a web connected between the support member and the base; and a guide configured to locate the cladding component on the support member. In another aspect, an assembly is provided for use in spacing a building component and a cladding component, the assembly comprising a spacer having: a support member, a base spaced apart from the support member, the base having a contact surface facing away from the support member, and a web connected between the support member and the base; and a guide adjacent the support member of the spacer, the guide configured to locate the cladding component relative to the spacer, wherein the support member, base and web and are features of a pultruded profile section. There is also provided a method for spacing a cladding component from a building component, the method comprising deforming each of a plurality of spacers to accommodate and retain by restorative bias force a corresponding plurality of portions of the cladding component; and securing the spacers to the building component.

In addition to the exemplary aspects and embodiments described above, further aspects and embodiments will become apparent by reference to the drawings and by study of the following detailed descriptions.

BRIEF DESCRIPTION OF DRAWINGS

The accompanying drawings show non-limiting example embodiments.

FIG. **1** is a perspective view of a prior art wall assembly.

FIG. **2** is a perspective view of a spacer according to an example embodiment.

FIG. **3** is a top plan view of the spacer shown in FIG. **2**.

FIG. **4** is a front elevation view of the spacer shown in FIG. **2**.

FIGS. **5**A, **5**B and **5**C show a sequence by which a cladding component may be mated with the spacer shown in FIG. **2**.

FIG. **6** is a top plan view of a spacer and cladding component assembly according to an example embodiment arranged for securement to a building component.

FIG. **7** is a top plan view of the assembly shown in FIG. **6** secured to the building component.

FIG. **8** is a front elevation view of the assembly shown in FIG. **6** secured to the building component.

FIG. **9** is a top plan view of a wall assembly according to an example embodiment.

FIG. **10** a cutaway perspective view of the wall assembly shown in FIG. **9**.

FIG. **11** is a graphic illustration of an example method for constructing a spacer and cladding component assembly according to an example embodiment.

FIG. **12** is a flowchart of a method for spacing a cladding component to a building component according to an example embodiment.

FIG. **13** is a graphic illustration of an example method for constructing a spacer and cladding component assembly according to an example embodiment.

FIG. **14** is a cutaway perspective view of a wall assembly incorporating the assembly shown in FIG. **13**.

FIG. **15** is a perspective view of a spacer according to an example embodiment.

FIG. **16** is a perspective view of a spacer, guide and cladding component assembly according to an example embodiment.

DESCRIPTION

Throughout the following description specific details are set forth in order to provide a more thorough understanding to persons skilled in the art. However, well known elements may not have been shown or described in detail to avoid unnecessarily obscuring the disclosure. Accordingly, the description and drawings are to be regarded in an illustrative, rather than a restrictive, sense.

Some building standards specify minimum prescriptive effective insulation R-values for wall assemblies. For example, the American Society Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standard 90.1 2007 specifies a minimum prescriptive R-value of R-13.0+R-7.5 continuous insulation (approximately an effective R-15.6 ft^2 h ° F./Btu) for a steel-framed wall assembly within Climate zone 5 (in which resides the Lower Mainland and Vancouver Island, British Columbia, Canada). It is desirable to achieve minimum prescriptive R-values specified by standards for many reasons, including that buildings that achieve these values may be maintained at comfortable interior temperatures with less energy consumption, and may be marketed as being energy efficient.

One way to increase the R-value of a wall assembly is to increase the amount of insulation provided in the wall assembly. However, there are disadvantages associated with increasing the amount of insulation in a wall assembly, including increased cost (for more or better insulation as well as other components such as deeper spacers or flashings), increased wall thickness, increased wall mass, loss of useable floor space, and the like, for example. Thermal simulations performed at the direction of the inventors have shown that increasing the thickness of insulation in wall assemblies comprising thermally conductive spacers improves thermal performance with diminishing returns. Table I is a summary of effective R-values estimates determined by thermal simulations for walls constructed in the manner of assembly **10** having various depths of insulation **32** and correspondingly dimensioned steel spacers **22**.

TABLE I

Thermal performance of wall assembly 10	
Mineral Fiber Insulation Thickness	Overall Effective Insulation R-value
3½ inches	11.6
4 inches	12.4
6 inches	15.6

The simulations were performed using the HEAT 3D™ three dimensional finite-element thermal analysis program. In the simulation, spacers **22** were specified as 16 gauge galvanized steel, girt **26** was 20 gauge steel C-girt, and insulation was specified as semi-rigid mineral fiber insulation boards (R-4.2 per inch). Spacers **22** were spaced 16" horizontally and 24" vertically. Fastening of spacers **22** between cladding **24** and wall **12** was specified as Leyland DT-2000 coated ¼" thread diameter steel screws. Exterior facing **30** was specified as ¾" stucco cladding. Material properties were taken from the HEAT 3D™ database and ASHRAE wintertime design conditions were used for the boundary conditions in the model.

FIGS. **2**, **3** and **4** show different views of a spacer **50** according to an example embodiment. More particularly:

FIG. **2** is a perspective view of spacer **50**;

FIG. **3** is a top plan view of spacer **50**; and

FIG. **4** is a front elevation view of spacer **50**.

Spacer **50** may be used for spacing a cladding component from a building component. Spacer **50** is made at least in part from thermally insulative material. In the illustrated example embodiment, spacer **50** comprises a pultruded profile section of a fibre reinforced polymer, namely fibreglass.

Spacer **50** comprises a support member **52**. Spacer **50** also comprises a base **54** spaced apart from support member **52**. Base **54** and support member **52** are connected by a web **56**. In the illustrated embodiment, spacer **50** is generally elongate (i.e. has long and short sides when seen as in FIG. **4**), though this is not necessary. In the illustrated embodiment, support member **52** and base **54** are generally rectangular. For convenience, the description may refer to long sides **52**L and **54**L of support member **52** and base **54**, respectively, and to short sides **52**S and **54**S of support member **52** and base **54**, respectively. In some embodiments, one or both of support member **52** and base **54** may be non-rectangular.

Base **54** has a contact surface **54**A facing away from support member **52**. Support member **52** and contact surface **54**A are generally parallel. In the illustrated embodiment, contact surface **54**A comprises a plane surface. Base **54** may comprise a differently configured contact surface. For example, a contact surface may comprise two or more spaced apart contact surfaces, a flat annular surface, or the like.

Spacer **50** comprises a guide **58**. Guide **58** is configured to locate a cladding component on support member **52**. In the illustrated embodiment, guide **58** comprises a U-shaped flexural member **60** adjacent to support member **52**. A first flange **62** of flexural member **60** extends along one of long sides **52**L of support member **52**. First flange **62** is generally parallel to support member **52**, such that a flat portion of a cladding component can rest stably on both support member **52** and first flange **62**. A flexure bearing **64** located along first flange **62** opposite to support member **52** joins first flange **62** to a second flange **66** of flexural member **60**. Flexure bearing **64** pivotally couples first flange **62** and second flange **66** to one another. Flexure bearing **64** provides the base of U-shaped flexural member **60**.

Flexure bearing **64** provides a stop which may be used to locate a cladding component over support member **52**. For example, a cladding component may be located on support member **52** by inserting the component into the mouth **60**A of flexural member **60** and abutting an edge of the component with flexure bearing **64**. In the illustrated embodiment, the stop provided by flexure bearing **64** is generally parallel to long sides **52**L of support member **52**.

It will be appreciated that guide **58** may have other configurations suitable for locating a cladding component on support member **52**. For example, guide **58** need not comprise second flange **66** in order to be configured to locate a cladding component on support member **52**. In some embodiments, guide **58** comprises one or more projections on or adjacent support member **52** for locating a cladding component by abutment therewith or by registration with corresponding recesses or apertures defined on or through support member **52**.

In the illustrated embodiment, flexural member **60** is configured to retain a cladding component against support member **52**. In particular, second flange **66** of flexural member **60** is configured to urge a cladding component against support member **52**. In the illustrated embodiment, free end **66**A of second flange **66** is resiliently displaceable away from support member **52** in direction generally perpendicular to contact surface **54**A of base **54**. When free end **66**A is displaced from its nominal position, flexure bearing **64** and/or second flange **66** generates a restorative bias force, which tends to urge free end **66**A toward support member **52**.

Free end **66**A of second flange **66** comprises a projection **68** that extends toward first flange **62**. In the illustrated embodiment, projection **68** extends across free end **66**A generally parallel to the long sides **52**L of support member **52**. Projection **68** is nominally located such that a cladding component to be retained against support member **52** cannot be inserted into mouth **60**A of flexural member **60** while the component is stably supported by support member **52**. In the illustrated embodiment, projection **68** is nominally spaced apart from the plane of support member **52** by less than the thickness of the cladding component to be retained against support member **52**.

In order for the cladding component to be inserted into flexural member **60**, projection **68** must be displaced away from support surface **52**. Flexural member **60** has two features that facilitate this. First, the outward edge **68**A of projection **68**, which is opposed to the plane of support member **52** and distal from flexure bearing **64** is bevelled. This may encourage a projection **68** to ride over the leading edge of a cladding component inserted into mouth **60**A, and thereby be displaced from its nominal position.

Second, a recess **70** defined on first flange **62** opposite projection **68** permits a cladding component to be inserted at an angle between projection **68** and first flange **62**, and used as a lever to displace projection **68** away from support member **52**. In the illustrated embodiment, recess **70** spans projection **68**. More particularly, the inward edge **70**A (proximate to flexure bearing **64**) of recess **70** is closer to flexure bearing **64** than projection **68**, and the outward edge **70**B (which is distal to flexure bearing **64**) of recess **70** is further from flexure bearing **64** than projection **68**. Edges **70**A and **70**B of recess **70** are smoothly bevelled.

FIGS. **5**A, **5**B and **5**C illustrate how recess **70** facilitates insertion of a cladding component into flexural member **60**. FIG. **5**A shows a Z-girt **72** inclined with respect to support member **52** and adjacent to projection **68**. In FIG. **5**A, arrow **74** indicates a direction along which Z-girt **72** may be moved for insertion into mouth **60**A of flexural member **60**. FIG. **5**B shows the leading edge of Z-girt **72** inserted into recess **70** between first flange **62** and projection **68**. Arrow **76** in FIG. **5**B indicates a direction in which Z-girt **72** may be rotated about outward edge **70**B of recess **70** to displace projection **68** in the direction away from support member **52**, which direction is indicated by arrow **78**. FIG. **5**C shows Z-girt **72** installed in flexural member **60**. In FIG. **5**C, projection **68** is biased by the restorative deformation force of flexure bearing **64** and/or second flange **66** to retain Z-girt **72** against support member **52**. Arrow **79** indicates a direction in which Z-girt **72** may be moved so that its leading edge abuts flexure bearing **64** as shown in FIG. **5**C.

In the illustrated embodiment, web **56** comprises two generally planar rigid walls **86** and **88**. Walls **86** and **88** extend between support member **52** and base **54** in a direction generally normal to support surface **52** and contact surface **54**A. Walls **86** and **88** meet support member **52** at opposite ones of its long sides **52**L, and are inwardly spaced from the long sides **54**L of base **54**. When walls **86** and **88** are oriented vertically, the force of gravity on cladding component located on support member **52** by guide **58** manifests as shear stress in walls **86** and **88**. The walls **86** and **88** act as webs to efficiently transfer the shear and compressive loads exerted by the cladding, back to the base **54**. The fasteners used in conjunction with the spacer transfer the tensile loads. Inclusion of flange **62** and base **54** make the spacer an efficient shape to resist flexural loads imposed by the cladding, and distribute the load over a greater area of the supporting back-up wall **92**. The length of the spacer can be readily adjusted to support a variety of different loads with the incorporation of this basic I shape oriented in the direction of the vertical gravity loads (but could be oriented in any direction).

The parallel, spaced apart arrangement of walls **86** and **88** provides torsional rigidity, which resists twisting of support member **52** relative to base **54** about axes generally normal to support member **52** and contact surface **54**A. Torsional rigidity of web **56** may be important where a cladding member may transmit torsional forces to support member **52** as a lever.

The rigid connection of walls **86** and **88** to support member **52** and base **54**, combined with the parallel spaced apart arrangement of walls **86** and **88** resists bending of walls about axes generally parallel to the long sides **52**L of support member **52**, since forces that would cause such bending manifest as compression in one wall and tension in the other. This resistance to bending may be important where cladding components connected to spacer **50** are subject to forces generally normal to walls **86** and **88**, such as may be caused by wind.

Two fastener paths **80**A and **80**B (referred to herein collectively as fastener paths **80**) are defined through spacer **50**. Fastener paths **80** are perpendicular to both support member **52** and contact surface **54**A of base **54**. Fastener paths **80** pass between walls **86** and **88**. In the illustrated embodiment, fastener path **80**A comprises a first aperture **82**A defined through support member **52** adjacent one of its short sides **52**S and a second aperture **84**A defined through base **54** adjacent one of its short sides **54**S. Fastener path **80**B comprises a first aperture **82**B defined through support member **52** adjacent the other of its short sides **52**S and a second aperture (not visible in the drawings) defined through base **54** adjacent the other of its short sides **54**S. Fastener paths **80** may be used for installing penetrating fasteners through spacer **50** to secure spacer **50** to a building component.

Guide **58** may be configured to locate a cladding component so that it is intersected by fastener paths **80**. For example, in the illustrated embodiment, guide **58** is configured to locate Z-girt **72** on support member **52** over first apertures **82**A and **82**B. Cladding components may be provided with apertures that register with fastener paths **80** when located on support member **52** by guide **58**. This may enable spacer **50** and a cladding component retained therein to be simultaneously secured to a building component with penetrating fastener.

In a non-limiting example embodiment, the dimensions of spacer **50** are as follows:

- long sides **52**L of spacer **52** and **54**L of base **54** are 4";
- support member **52** and base **54** are each ¼" thick;
- walls **86** and **88** are each 3/16" thick;
- the distance between walls **86** and **88** is ⅜";
- the distance from contact surface **54**A to the opposite facing face of support member **52** is 3½";
- first flange is ¼" thick;
- second flange is ⅛" thick;
- first flange **62** and second flange **66** are spaced apart by ⅛";
- projection **68** and recess **70** are 1/16" deep; and
- apertures **82**A, **82**B, **84**A and the second aperture in base **54** not visible in the drawings are centered ½" inward of the proximate long sides of the bodies in which they are defined.

In this embodiment, the features of flexural member **60** are dimensioned to accommodate a 16 gauge steel cladding component.

FIGS. **6**, **7** and **8** illustrate an example installation of spacer **50** and Z-girt **72**. FIG. **6** is a top plan view showing Z-girt **72** assembled with spacer **50**. As previously shown in FIG. **5**C, Z-girt **72** is retained against support member **52** by flexural member **60**. Contact surface **54**A of base **54** is placed against the outside of a building wall **92** in alignment with a C-channel steel stud **94**. A penetrating fastener, namely self-tapping lag screw **96**, is inserted through an aperture defined in Z-girt **72** and along fastener path **80** in the direction shown by arrow **98**. FIG. **7** is a top plan view showing screw **96** engaged with the outer panel of wall **92** and C-channel stud **94** to secure spacer **50** and girt **72** to wall **92**. FIG. **8** is a side elevation view showing the heads of screws **96** bearing against Z-girt **72** to retain Z-girt **72** and spacer **50** against wall **92**.

FIGS. **9** and **10** are, respectively, top plan and perspective views of a wall assembly **110** incorporating spacer **50**. Assembly **110** is generally similar to assembly **10**. The reference numerals used to identify components of assembly **10** are prefaced with the numeral '1' to identify like components of assembly **110** in FIG. **10**, and are not described again. It can be seen that in the illustrated embodiment, guide **58** of spacer **50** abuts an outer face **132**A of insulation **132**, thereby retaining the proximate side of insulation **132** against wall **112**. It may also be seen that flange **72**A of Z-girt **72**, though not shown in abutment with insulation **132**, may act to retain a proximate side of insulation **132** against wall **112**.

Thermal simulations performed at the direction of the inventors have shown that the thermal insulation performance of wall assembly **110** is significantly improved over assembly **10**. Table II is a summary of effective R-values estimates determined by thermal simulations for walls constructed in the manner of assembly **110** having various depths of insulation **132** and correspondingly dimensioned spacers **50** having length of 6". The simulations whose results are summarized in Table II were performed using the same parameters as the simulations whose results are summarized in Table I.

TABLE II

Thermal performance of wall assembly 110	
Mineral Fiber Insulation Thickness	Overall Effective Insulation R-value
3½ inches	14.7
4 inches	16.4

FIG. **11** graphically illustrates an advantage provided by the ability of spacer **50** to retain cladding components. FIG. **11** shows how three spacers **50**A, **50**B and **50**C (referred to collectively herein as spacers **50**) may be clipped to a Z-girt **120**. Z-girt **120** has a plurality of holes **122**. By registering the apertures of spacers **50** with corresponding holes **122** in Z-girt **120**, spacers **50** may be located appropriately on Z-girt **120** without measuring. Holes **122** may be pre-drilled in Z-girt **120** to streamline the installation of girt **120**. Holes **122** may provide center-to-center spacing between adjacent spacers **50** (marked as 11Δ on assembly **124**) that is less than 16", between 16" and 32", between 22" and 26", about 24", or more than 32", for example.

Once spacers **50** are clipped to Z-girt **120**, the assembly **124** formed thereby may be positioned on a wall, and then secured to the wall by driving fasteners into the wall through Z-girt **120** and spacers **50**. It may be convenient to hang assembly **124** by securing uppermost spacer **50**A to a wall first, and then securing the lower spacers **50**B and **50**C to the wall. Because spacer **50**A may be fastened to a wall using a plurality of fasteners that are co-linear with the longitudinal axis of Z-girt **120** (i.e., fasteners that pass through holes **122**, which are co-linear with the longitudinal axis of Z-girt **120**), assembly **122** may be hung in a desired alignment (e.g., vertically) by securing just spacer **50**A.

It is thus apparent that the technology described herein enables methods for securing a cladding component to a building component. FIG. **12** is a flowchart of a method **140** according to an example embodiment. Step **142** of method **140** comprises clipping a plurality of spacers onto a cladding component. In step **142**, spacers may be clipped onto the building component at spaced apart locations. In some embodiments, step **142** comprises clipping spacers that have apertures defined through them onto a cladding component such that the apertures defined through the spacers register with corresponding apertures defined through the cladding component. In some embodiments, step **142** comprises one or more of the steps and/or actions shown in FIGS. **5**A, **5**B and **5**C and described herein. For example, clipping a plurality of spacers onto a cladding component may comprise deforming each of the plurality of spacers to accommodate and retain by restorative bias force a corresponding plurality of portions of the cladding component, for example.

Step **144** comprises aligning one of the spacers clipped to the cladding component with a building component. Step **144** may comprise aligning a spacer located at an end of a cladding component with a building component such as stud, for example. Step **144** may comprise aligning the spacer with the building component such that the other spacer(s) clipped to the building component are below the spacer being aligned. In step **134**, one spacer may be aligned so that the other spacer(s) clipped to the cladding component are aligned with the building component.

Step **146** comprises fastening the spacer aligned in step **144** to the building component. Step **146** may also comprise fastening a portion of the cladding component to the building component. In some embodiments, step **146** comprises fastening the spacer aligned in step **144** and the cladding component to the building component at the same time, such as is shown in FIGS. **9** and **10**, for example. Where in step **144** a spacer is aligned with the building component such that the other spacer(s) clipped to the cladding component are below the spacer that is aligned, step **146** may comprise hanging the cladding component and the other spacer(s) clipped thereto from the spacer fastened to the building component.

Step **148** comprises fastening the other spacer(s) clipped to the cladding component to the building component. In some embodiments, the cladding component is fastened to the building component at the same time that the spacers are fastened to the building component, such as is shown in FIGS. **9** and **10**, for example.

FIGS. **13** and **14** illustrate an alternative embodiment comprising differently configured spacers. In FIG. **13** a first longer spacer **150** is clipped to a first end of a Z-girt **152**, and three shorter spacers **154**A, **154**B and **154**C (collectively referred to herein as spacers **154**) are clipped along the remainder of Z-girt **152**. Spacers **150** and **154** have uniform cross-section, which is the same as the cross section of spacer **50**. Spacers **150** and **154** clipped to girt **152** provide assembly **158**. FIG. **14** shows a cutaway perspective view of a wall assembly **160** comprising assembly **158**.

Spacer **150** has three fastener paths defined though it in generally the same manner as fastener paths **80** are defined through spacer **50**. In spacer **150**, adjacent first and second ones of the fasteners paths are more closely spaced than the adjacent second and third ones of the fastener paths. Spacers **154** each have one fastener path defined though them in generally the same manner as fastener paths **80** are defined through spacer **50**. The fastener paths defined through spacer **154** are centered at approximately the centers of their respective support members and bases.

Z-girt **152** has holes **156** that provide appropriate separation between spacers **150** and **154**. Center-to-center spacing **12**A between adjacent spacers **150** and **154** (marked on assembly **158**) may be less than 16", between 16" and 32", between 22" and 26", about 24" or more than 32", for example.

In a non-limiting example embodiment, spacer **150** is 6" long and spacers **154** are 2" long. Where spacer **150** is relatively longer, it will be able to support relatively greater gravitational loads (e.g., a longer Z-girt **152** and a greater number of inferiorly located spacers **154**). Where spacer **150** provides greater support for gravitational loads, spacers **154** need provide correspondingly less support, and may be made shorter. In some cases, the primary function of spacers **154** is to provide support against lateral (including forces perpendicular to the wall plane) forces acting on cladding connected to them.

FIG. **15** is a perspective view of a spacer **250** according to an example embodiment and a guide **300** according to an example embodiment. Spacer **250** and guide **300** may be used together to space a cladding component from a building component. Spacer **250** is generally similar to spacer **50**. The reference numerals used to identify feature of spacer **50** are prefaced with the numeral '2' to identify like components of spacer **250** in FIG. **15**, and are not described in detail again.

Spacer **250** differs from spacer **50** in that it does not have a guide adjacent to support member **252** for locating a cladding component on support member **252**. Instead, guide **300** is configured to be mounted on support member **252**. Guide **300** is configured to locate a cladding component relative to support member **252**. It may be observed from FIGS. **15** and **16** that spacer **250** has uniform cross section. In some embodiments, spacer **250** comprises a pultruded profile section of a fibre reinforced polymer, such as fibreglass, for example.

To facilitate mounting guide **300**, an aperture **253** is defined through support member **252**. A corresponding aperture **302** defined through body **304** of guide **300** may be registered with aperture **253** of support member **252** to align guide **300** with support member **252**. A locating member, such as headed screw **320** (a penetrating fastener), for example, may inserted into registered apertures **253** and **302** to maintain an alignment of guide **300** with support member **252**.

In some embodiments, alignment of guide **300** and support member **252** is facilitated in other ways. For example, guide **300** may comprise a bracket configured to engage the support member **252** between walls **286** and **288**. In some embodiments, guide **300** comprises a bracket configured to engage support member **252** along one of its short sides between walls **286** and **288**. In some embodiments, guide **300** comprises a tab that extends from one of its sides and is manually deformable to form such a bracket. Guides and tabs of this sort may be provided on opposed sides of guide **300**.

A pair of apertures **306**A and **306**B are defined through body **304** of guide **300**. Apertures **306**A and **306**B may be simultaneously registered with apertures **282**A and **282**B, respectively, of support member **252**. Where this is done, fastener paths **280**A and **280**B of spacer **250** extend through apertures **306**A and **306**B.

Guide **300** comprises a pair of flanges **362**A and **362**B (referred to collectively herein as flanges **362**). Flanges **362** are parallel and spaced apart from body **304**. In the illustrated embodiment, flanges **362** are integral with body **304**. More particularly, flanges **362**A and **362**B comprise spaced apart tabs extending from a side of body **304** that have been folded over body **304**. Flanges **362**A and **362**B are located on opposite sides of aperture **306**A.

As shown in FIGS. **15** and **16**, guide **300** is configured to locate a cladding component, namely hat channel **372** over support member **252**. Hat channel **372** may be inserted between flanges **362** and body **304** in the direction indicated by arrow **374**. In some embodiments, hat channel **372** may also be inserted between flanges **362** and body **304** in the direction across body **304** toward the side of guide **300** where flanges **362** meet body **304**. Flanges **362** provide a stop which may be used to locate hat channel **372** over support member **252**. In the illustrated embodiment, the stop provided by flanges **362** is located along the edge of body **304** from which flanges **362** extend. The stop provided by flanges **362** is perpendicular to the long sides of support member **252**. Where spacer **250** comprises a pultruded profile section, flanges **362** are perpendicular to the pultrusion axis of spacer **250**.

Guide **300** may be configured to retain a cladding component. In the illustrated embodiment, flanges **362** are nominally spaced apart from body **304** by slightly less than the thickness of portion **372**A of hat channel **372**, and are resiliently displaceable from their nominal position relative to body **304**. Inserting portion **372**A of hat channel **372** between body **304** and flanges **362** causes flanges **362** to be displaced away from body **304**. Thus displaced from their nominal positions, flanges **362** are biased by restorative deformation forces to retain hat channel **372** against body

304. In some embodiments, additional flanges are provided on the side of body **304** opposite to the side from which flanges **362** extend. For example, a second pair of flanges may be provided opposite flanges **362**.

A pair of apertures **376**A and **376**B are defined through hat channel **372**. Apertures **376**A and **376**B may be one pair of a plurality of pairs of apertures defined through hat channel **372** along its length. Apertures **376**A and **376**B may be simultaneously registered with apertures **282**A and **282**B, respectively of support member **252** and with apertures **306**A and **306**B, respectively, of guide **300**. Where this is done, fastener paths **280**A and **280**B of spacer **250** extend through apertures **376**A and **376**B. Penetrating fasteners may be inserted through apertures **376**A and **376**B, through apertures **306**A and **306**B and through apertures **282**A and **282**B along fastener paths **280**A and **280**B into a building component to secure spacer **250**, guide **300** and hat channel **372** to the building component.

It will be appreciated that a plurality of guides **300** may be attached to a corresponding plurality of spacers **250**, the assembled guides **300** and spacer **250** clipped to hat channel **372**. In some embodiments, a plurality of guides **300** may be clipped to hat channel **372** before the guides **300** are mated with corresponding spacers **250**.

Advantageously, the combination of spacer **250** and guide **300** permits an elongate cladding component to be supported in a horizontal orientation while walls **286** and **288** are oriented vertically, so that the force of gravity on the cladding component manifests as shear stress in walls **286** and **288**. In some embodiments, hat track **272** has apertures **376**A and **376**B located at approximately the center of its length, and a single spacer **250** is sufficiently strong to support hat track **272**. In such embodiments, hat track **272** may be secured to a building component according to a variant of method **140** in which a centrally located spacer **250** and guide **300** is the first-fastened spacer.

Where a component is referred to above (e.g., a spacer, support member, base, contact surface, web, guide, flexural member, flexure bearing, flange, projection, recess, wall, aperture, fastener path, fastener, cladding component, etc.), unless otherwise indicated, reference to that component (including a reference to a "means") should be interpreted as including as equivalents of that component any component which performs the function of the described component (i.e., that is functionally equivalent), including components which are not structurally equivalent to the disclosed structure which performs the function in the illustrated exemplary embodiments of the invention.

Unless the context clearly requires otherwise, throughout the description and the claims, the words "comprise," "comprising," and the like are to be construed in an inclusive sense, as opposed to an exclusive or exhaustive sense; that is to say, in the sense of "including, but not limited to." Where the context permits, words in the above description using the singular or plural number may also include the plural or singular number respectively. The word "or," in reference to a list of two or more items, covers all of the following interpretations of the word: any of the items in the list, all of the items in the list, and any combination of the items in the list.

The above detailed description of example embodiments is not intended to be exhaustive or to limit this disclosure and claims to the precise forms disclosed above. While specific examples of, and examples for, embodiments are described above for illustrative purposes, various equivalent modifications are possible within the scope of the technology, as those skilled in the relevant art will recognize.

These and other changes can be made to the apparatus in light of the above description. While the above description describes certain examples of the technology, and describes the best mode contemplated, no matter how detailed the above appears in text, the technology can be practiced in many ways. As noted above, particular terminology used when describing certain features or aspects of the apparatus should not be taken to imply that the terminology is being redefined herein to be restricted to any specific characteristics, features, or aspects of the system with which that terminology is associated. In general, the terms used in the following claims should not be construed to limit the system to the specific examples disclosed in the specification, unless the above description section explicitly and restrictively defines such terms. Accordingly, the actual scope of the technology encompasses not only the disclosed examples, but also all equivalent ways of practicing or implementing the technology under the claims.

From the foregoing, it will be appreciated that specific examples of apparatus have been described herein for purposes of illustration, but that various modifications, alterations, additions and permutations may be made without departing from the practice of the invention. The embodiments described herein are only examples. Those skilled in the art will appreciate that certain features of embodiments described herein may be used in combination with features of other embodiments described herein, and that embodiments described herein may be practiced or implemented without all of the features ascribed to them herein. Such variations on described embodiments that would be apparent to the skilled addressee, including variations comprising mixing and matching of features from different embodiments, are within the scope of this invention.

As will be apparent to those skilled in the art in light of the foregoing disclosure, many alterations and modifications are possible in the practice of this invention without departing from the spirit or scope thereof. For example:

- Spacers according to embodiments of the invention may be used to space and secure cladding components (including insulation) other than those specifically shown and described herein. For example, spacers according to embodiments of the invention may be used to space Z-girts, C-channel girts, J girts, hat tracks, purlins and the like.
- Spacers according to embodiments of the invention formed by pultrusion or like processes which result in uniform cross sections may subsequently modified to have non-uniform cross sections. For instance, corners of spacers may be bevelled or rounded.
- Spacer that lack integral guides (such as spacer **250**, for example) may comprise features for cooperating with corresponding features of externally provided guides (such as guide **300**, for example). Such cooperating features may enable spacers and guides to be located and/or joined without other components (e.g., locating members, fasteners). For example, cooperating features on spacers and guides may provide snap fit engagement between spacers and guides.
- Spacers may comprise features for retaining cladding components that are different in structure or manner of function than flexural member **60**.
- Spacers need not be shorter than the length of the cladding components they space and/or secure. For example, a spacer be the same length, or be longer than, a girt it spaces and/or secures.

The plastic matrix of spacers from fibreglass may comprise epoxy, thermosetting plastic, thermoplastic, combinations thereof or the like.

Spacers may be made from materials other than fibreglass. For example, in some embodiments, spacers are made from other fibre-reinforced polymers, such as polyamides. Other possible materials with low conductivity characteristics which could be employed are Aerogel, polystyrene, cork, polypropylene, PVC, ABS, polycarbonate, polyamide/nylon, neoprene, and acrylic/plexiglass.

While a number of exemplary aspects and embodiments have been discussed above, those of skill in the art will recognize certain modifications, permutations, additions and sub-combinations thereof. It is therefore intended that the following appended claims and claims hereafter introduced are interpreted to include all such modifications, permutations, additions and sub-combinations as are within their true spirit and scope.

What is claimed is:

1. A spacer for use in spacing a cladding component from a building component, the spacer comprising:

a support member;

a base spaced apart from the support member, the base having a contact surface facing away from the support member, and the support member having a support surface facing away from the base;

a web extending between the support member and the base; and

a resiliently displaceable clip provided on the support surface of the support member and configured to retain the cladding component on the support member;

the resiliently displaceable clip comprising a flange configured to retain the cladding component against the support member on the support surface, at least a portion of the flange being resiliently displaceable away from the support member, the resiliently displaceable portion of the flange comprising a projection, the support member comprising a recess on the support surface, the recess being positioned opposite to and spanning the projection.

2. The spacer of claim **1** wherein the spacer comprises a fibre reinforced polymer.

3. The spacer of claim **2** wherein the spacer comprises fibreglass.

4. The spacer of claim **1** wherein the support member, base, web and resiliently displaceable clip are features of a pultruded profile section.

5. The spacer of claim **4** wherein the support member is elongate, and wherein the resiliently displaceable clip provides a stop parallel to one of the long sides of the support member.

6. The spacer of claim **1** wherein the resiliently displaceable portion of the flange is resiliently displaceable away from the support member in a direction generally normal to the support member.

7. The spacer of claim **6** wherein the resiliently displaceable clip comprises a flexure bearing connected to the flange, the flexure bearing allowing the resiliently displaceable portion of the flange to be resiliently displaced away from the support member.

8. The spacer of claim **7** wherein the resiliently displaceable clip comprises a U-shaped flexural member adjacent to the support member, the U-shaped flexural member comprising the flange and the flexure bearing.

9. The spacer of claim **1** wherein the support member comprises an aperture defined through it.

10. The spacer of claim **9** wherein the resiliently displaceable clip is configured to locate the cladding component over the aperture defined through the support member.

11. The spacer of claim **10** wherein the base has an aperture defined through it, and when the contact surface abuts the building component, the apertures defined in the base and the support member define a fastener path normal to the building component.

12. The spacer of claim **1** wherein the spacer is comprised of a low thermal conductivity material.

13. The spacer of claim **1** wherein the at least a portion of the flange that is resiliently displaceable away from the support member comprises a free end of the flange.

14. The spacer of claim **13** wherein one or both of an inward edge and an outward edge of the recess are smoothly beveled.

15. An assembly for use in spacing a building component and a cladding component, the assembly comprising:

a spacer having:

an elongate support member,

a base spaced apart from the support member, the base having a contact surface facing away from the support member, and

a web connected between the support member and the base; and

a resiliently displaceable clip adjacent the support member of the spacer, the resiliently displaceable clip configured to retain the cladding component relative to the spacer and to provide a stop perpendicular to one of the long sides of the support member, the resiliently displaceable clip comprising:

a body generally parallel to the support member, and

a flange spaced apart from the body, wherein the flange comprises a tab extending from the body and folded over the body along a fold perpendicular to one of the long sides of the support member,

wherein the support member, base and web and are features of a pultruded profile section.

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